SIMULATION MODEL TO MIMIZE IDLE TIME AT SHIPPING TRANSPORTATION

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ABSTRACT

Simulation modelling is the process of creating and analysing a digital prototype of a physical model to predict its performance in the real world. Simulation modelling is used to help designers and engineers understand whether, under what conditions, and in which ways a part could fail and what loads it can withstand. The simulation is to perform the one flow to reduce idle time with the real shipping procedure. The shipping department can be the area that causes claims for loss, damage, non-delivery or delay, or worse, that results in a law suit filed against your Company.

Keywords: Simulation model, shipping procedure, idle time

ABSTRAK

Pemodelan simulasi adalah proses mencipta dan menganalisis prototaip digital model fizikal untuk meramalkan prestasi dalam dunia sebenar. Pemodelan simulasi digunakan untuk membantu pereka dan jurutera memahami sama ada, dalam keadaan apa, dan di mana cara bahagian yang boleh gagal dan apa yang memuatkan ia boleh menahan. Simulasi ini adalah untuk melaksanakan satu aliran untuk mengurangkan masa terbiar dengan prosedur penghantaran melalui kapal. Jabatan penghantaran boleh menjadi kawasan yang menyebabkan tuntutan bagi kehilangan, kerosakan, yang tidak dihantar atau kelewatan, atau lebih teruk lagi, yang mengakibatkan saman undang-undang yang difailkan terhadap Syarikat anda.

Kata Kunci: model simulasi, prosedur penghantaran, masa terbiar

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CHAPTER 1

BACKGROUND

1.1 INTRODUCTION

Over 40 years ago, the pattern and importance of shipping have changed drastically – probably more so in the past decade than in any era during the past hundred years. This is demonstrated by the fact that throughout this period of 40 years, 1965–2005, world seaborne trade has increased by over 450% from 6,000 to 28,000 billion ton miles. The change has been fast moving and driven by many factors. Today we live in a global environment in which shipping and trade are inextricably linked as never before. The shipper is driving the shipping industry and their spouse is to focus continuously on ship productivity with a strong interface integrated with other transport modes: overland/inland waterways/air. As was explained by Alan E.Branch (2007), shipping has change to be better transportation with their element from the increasing of customer and the time using. Function of shipping is the conveyance of goods from where their utility is low to a place where it is higher. Goods may consist of raw materials conveyed in bulk cargo shipments or purpose-built containers, equipment components/parts for assembly at an industrial plant. The factors influencing the shipper's choice of transport mode has changed dramatically during the past decade. Today it is based on the total product concept embracing all the constituents of distribution logistically driven. These include reliability, frequency, cost, transit time, capital tied up in transport, quality of service, packaging, and import duty, insurance and so on. So for the main shipping problem is about idle time that related with the shipping element like source, destination and weighted edge to make problem like delayed, missed time and weather problem.

Megalift Sdn Bhd is one big company of shipping in Malaysia that not only conduct project Sea freight but also conduct Super Heavy Transport, Lifting & Installation, Barging and RORO, and so on. So, for the shipping part is about the Project Sea freight Megalift is most experienced in arranging any mode of ocean transport to meet your logistics requirement in terms of points of supply, cargo readiness, L/C stipulation, inland routing, customs regulations, precise transit time, cargo specifications, by container ship (FCL or LCL, conference or non-conference) break-bulk vessel, geared heavy lifter, roro carrier or barge and whether from regular seaports or remote loading point, anywhere overseas to any port in Malaysia and the region or vice versa. So from this shipping company element of time, source, destination and weighted edge is to compare with the simulation data that I need to do. In this company there has many type of application that can be choose.

Then is about simulation is a powerful technique for solving a wide variety of problems. The basic idea behind simulation is to simply construct a model for given system by means of some equations and to determine its time given systems by means of equations and to determine its time dependent behavior. For mathematical model of a system, it is sometimes possible to get information about the system by analytical means. However, many systems are highly complex precluding any possibility of an analytical solution. Simulation may define as, numerical exercising of the model for the inputs in questions to see how they affect the output measures of performance. Normally, simulation is used for analytical solution for time consuming and expensive or an exact analytical expression is not available for representing the behavior of the systems. Reproduction is emergence of virtual world; simulation is fundamentally alludes to the impersonation or speaking to of potential arrangement of occasions and situations. Reproduction these days considered as an examination apparatus, particularly for a leader, adding validity and quickness to an investigation. Simulation is characterized as the methodology of making a model existing or proposed framework to recognize and comprehend those elements which control the framework and to foresee the future conduct framework. Reproduction has additionally ended up being profitable apparatus for separation learning assessment framework, where web based test systems may be utilized. Recreation is turning into an imperative help in accomplishing larger amount of productivity and benefit. As explained by Pratiksha Saxena (2011), the simulation is about mathematic that solve the data to be a better data. Simulation also

creates one system to make easier program and to solve analytical problem. It is also to recognize the main problem in one system that has been run.

1.2 PROBLEM DESCRIPTION

1.2.1 Problem Background

The main important of the shipping problem is about applications of quantitative analysis to solving business problems has been in the physical distribution of products, commonly referred to as transportation problems. (J. Reeb and S. Leavengood, 2002). 3However, not all the transportation systems are necessarily successful regarding reducing costs and increasing quality.

So from the main problem of the shipping element, we need to minimize the problem with using the simulation treatment to reduce the main problem of idle time that affect the business problem and run from the exact scheduling. The shipping has many type of item that sometime affect with weather that needs to delay the time of shipping. So from the problem, we need to consider many type of element that relate with the idle time that need to solve and recognize the problem

1.2.2 Problem Statement

A typical of shipping problem is based on the elements that relate with the idle time. Object First problem is about the element in transportation make missed time from the exact time like lack of timing to conduct a bulk of items. Missed time always happen in shipping company if has problem in element of shipping. Then is about the cost of shipping that relates to the idle time, cost is important to customer and customer need the lowest cost to make a shipping service and then is about the the type of element that effect time scheduling is about the weighted edge, source and destination. Idle time can be happen with the element problem, so analyses the data of shipping is important to reduce cost and make shipping service send item on time. Then the destination of the shipping departure also as a problem when the ship needs to go a long destination before touch down to the port.

1.3 RESEARCH OBJECTIVE

For the purpose of meeting the idle time of shipping company with the main of element of shipping problem, and to avoid the missed or delayed time also effect the business and loss profit and money due to the inability to optimization the line of shipping; this study aims to meets to following objective;

1. To investigate the element of transportation problem that effect idle time.
2. To identify the shipping tariff of product that effect idle time cost.
3. To analyses the data of shipping with element of transportation by simulation model.

1.4 RESEARCH METHOD

The method that to use is simulation with arena software, Simulation models are the base of simulations. They could be physical or logical and are done in different ways, to suit the circumstances. It could be possible to physical simulation and test a system, e.g. building a Starbucks in-house, have an online voting system, or traffic lights to control the traffic driving onto a highway. In comparison though, some systems are too big or critical to play with; a flight control system or emergency room protocols. The physical system could not be there yet: an underground parking lot, which needs to fulfill service and profitability criteria and still needs to be built. The logical, also called mathematical model, addresses problems where mathematical solutions have been worked out. We are able to computer analyze the behavior of a valid logical model with assumptions and approximations. Simulations can be used, when the valid models become too complicated or exact mathematical solutions are not worked out. Simulation development has an own process due to the system information accuracy level, which has to be qualitatively high for the simulation to fulfill its goal of giving insight on the system. If we are implementing a simulation for a real system, we collect input and output data where applicable to use during the validation and simulation process. For a virtual system, the quality of the data and understanding its origin is significant to the validation process according to Law and Kelton. A simulation produces a result, which is analyzed and processed. The model is adjusted and the experiments are repeated or new ones are run. The goal of the simulation indirectly specifies the result processing steps: If just confirmation was needed for a system, the design or model is hereby

confirmed or demented. With a system where an optimal solution is part of the goal, as in our supply chain, an optimization process is included in the result processing. The system is optimized and experiments are run again with the optimized model until with necessary accuracy a solution has been found. The iterative validation process is part of result processing and is integrated in the Data Specification as well as in the Process Specification. (Prof. Dr. Andreas Rinkel, 2011) from the method is about the simulation that we run is to compare the real data with the simulator that have we made to improve the real situation. Simulation also provides the much better framework to solve the main problem that relate with idle time. The advantage of using simulation method is like very easy to use, can made interface that like reality, and dynamic graphical animation system component as they move around and change.

The software that we used to run the simulator is the arena software, using this environment software you can build simulation method using drag and drop construction process. The arena software Environment facilities the model building process, the model running process, and the output analysis process. It is a simple model to introduce and provide an overview of the modeling capabilities in the Arena Environment. Arena has been completely with the view, draw, and animate transfer toolbars detached in the environment. Arena has a strong academic and industrial user base, and is very competitive in the simulation marketplace. Arena is fundamentally a process that an entity experiences while flowing through or using the elements of the system. Arena is the preeminent solution for better business decision with simulation. Arena is an easy to use, powerful tool that allows us to create and run experiments on models of the systems. By testing out the ideas in the computer, we can predict the future with confidence and without disrupting our current business environment. Any business environment, from customer service to manufacturing to health care, can benefit from simulation. And weather the analyzing an existing supply chain or a new emergency room layout, in the Arena we have five easy step to follow is create a basic model, refine the model, simulate the model, analyze simulations results and select the best alternative. (Manuel D.Rossetti, 2010) so from the arena software we have general purpose simulation package, process oriented and we have high –level that is very easy to use by graphical user interfaces, menu and dialogues. Once you learn one simulation language well, it is much easier to switch to another language and to understand which

languages will be more appropriate for certain modeling situations. This method is use for made new system to reduce idle time that relate with the shipping problem elements.

1.5 SCOPE OF STUDY

The scope of the study is on the shipping line process in the shipping company in Malaysia. The shipping line basically operates with some idle time compared to other shipping company. The simulation model will be structured based on the shipping line process, from how the product be conducted, and how long time the shipping line need to reach the destination and how many idle time that can be reduce.

To facilitate the purpose of this study, a local private shipping company situated in Port Kelang, Selangor will be used as the platform of study. Data for the simulation model will be collected from the shipping line process with the permission along with the site visits to the company to witness the processing line and to comprehend data process involved even further. What was aimed in the simulation model is to observe the utilization of the current shipping line in the shipping company; whether the processing of the shipping is fully utilized and how to improve so if there is space for improvements in the sense of time and costs of shipping line.

1.6 SIGNIFICANT OF STUDY

The idea of using simulation modeling to observe the numerous entities, variables and factors of the process flow is not the something new in the western companies. However, for country like Malaysia, it is still not be explored and it is still considered as a relatively uncommon form of technology and there are still multitudes of area to be explored locally by using modeling and simulation. The logistic sector especially the shipping industry definitely could use the simulation method as a way to improve its shipping line efficiency and to highlight the cause of idle time errors and problems. The study of simulation method on shipping line from the view of observing and improving its process efficiency of time consuming is which therefore brings to the significance of this study.

1.7 OPERATIONAL DEFINITION

i. Simulation: The process that attempting to predict aspect of the behavior of some system by creating an approximate by mathematical model for it. The process of structuring and running a model or imitation of realistic system that is for observation and evaluation

ii. Process flow: A flow of action that passes materials or information/data as it purpose through one phase to another phase.

iii. Logistics: Logistics is the management of the flow of goods between the point of origin and the point of consumption in order to meet some requirements, for example, of customers or corporations.

iv. Idle time: Unproductive time on the part of employees or machines as a result of factors beyond their control. Idle time is the time associated with waiting, or when a piece of machinery is not being used but could be.

1.8 EXPECTED RESULT

Based on this study, the expected result from the simulation by using Arena Environment that has built is it will be able to improve the efficiency of the shipping flow process by reducing idle time, identified the best way of shipping line to reduce time to reach destination, and solving the elements problem that effect idle time. Then, at the same moment, this simulation model can also drive for improving logistic and supply system.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This purpose of this chapter is to provide a review of past research efforts related to simulation model to minimize the idle time at the shipping transportation, shipping carrier, idle time, optimization, and simulation model. A review of other relevant research studies is also provided. Substantial literature has been studied on idle time of shipping transportation, element of transportation problem that related with idle time and how to solve it. The review is organized chronologically to offer insight to how past research efforts have laid the groundwork for subsequent studies, including the present research effort. The review is detailed so that the present research effort can be properly tailored to add to present body of literature as well as to justly the scope and direction of the present research effort.

2.2 OVERVIEW OF SHIPPING TRANSPORTATION

The change has been fast moving and driven by many factors. Today we live in a global environment in which shipping and trade are inextricably linked as never before. The shipper is driving the shipping industry and the response is to focus continuously on ship productivity with a strong interface integrated with other transport modes: overland/inland waterways/air (Alan e. Branch, 1964). Ships of all types spend large part of their lives in port, and these idle ads substantially to the cost of providing shipping service. Technological progress has made possible the construction of larger, faster and more economical ships, but organization and cargo handling in ports have not kept pace (Trevor D, Heaver and Keith, 1972). This section discussed the shipping

transportation line for reducing idle time by element of transportation problem effect, design of shipping line, methods of shipping process and decision to support system.

2.2.1 History of Shipping Transportation

Into the 1950s, most goods transported on water over long distances were shipped by what is called break bulk shipping, in which goods were transported loose or packaged in boxes, bags, barrels, or other relatively small containers that varied depending on the type of good. A major cost in break bulk shipping is time and labor spent loading and unloading ships at portside in ways that avoid damage to the goods (John Tomlinson, 2009). The idea of using some type of shipping container was not completely novel. Boxes similar to modern containers had been used for combined rail- and horse-drawn transport in England as early as 1792. The US government used small standard-sized containers during the Second World War, which proved a means of quickly and efficiently unloading and distributing supplies. However, in 1955, Malcom P. McLean, a trucking entrepreneur from North Carolina, USA, bought a steamship company with the idea of transporting entire truck trailers with their cargo still inside. He realized it would be much simpler and quicker to have one container that could be lifted from a vehicle directly on to a ship without first having to unload its contents (Alphaliner, 2009). The history of maritime shipping stretches back thousands of years to the times of the earliest humans, for as long as there have been people they have wanted to explore what was beyond the seas. Today, maritime shipping is just as important as it has ever been, although the countries benefiting from these trade routes have shifted throughout history (Rupert Colley, 2011). Figured 2.1 are shows the evolution of container ships that make improvement by the generation. It is compared the present year and the quantity of container that improve the quantity of container.

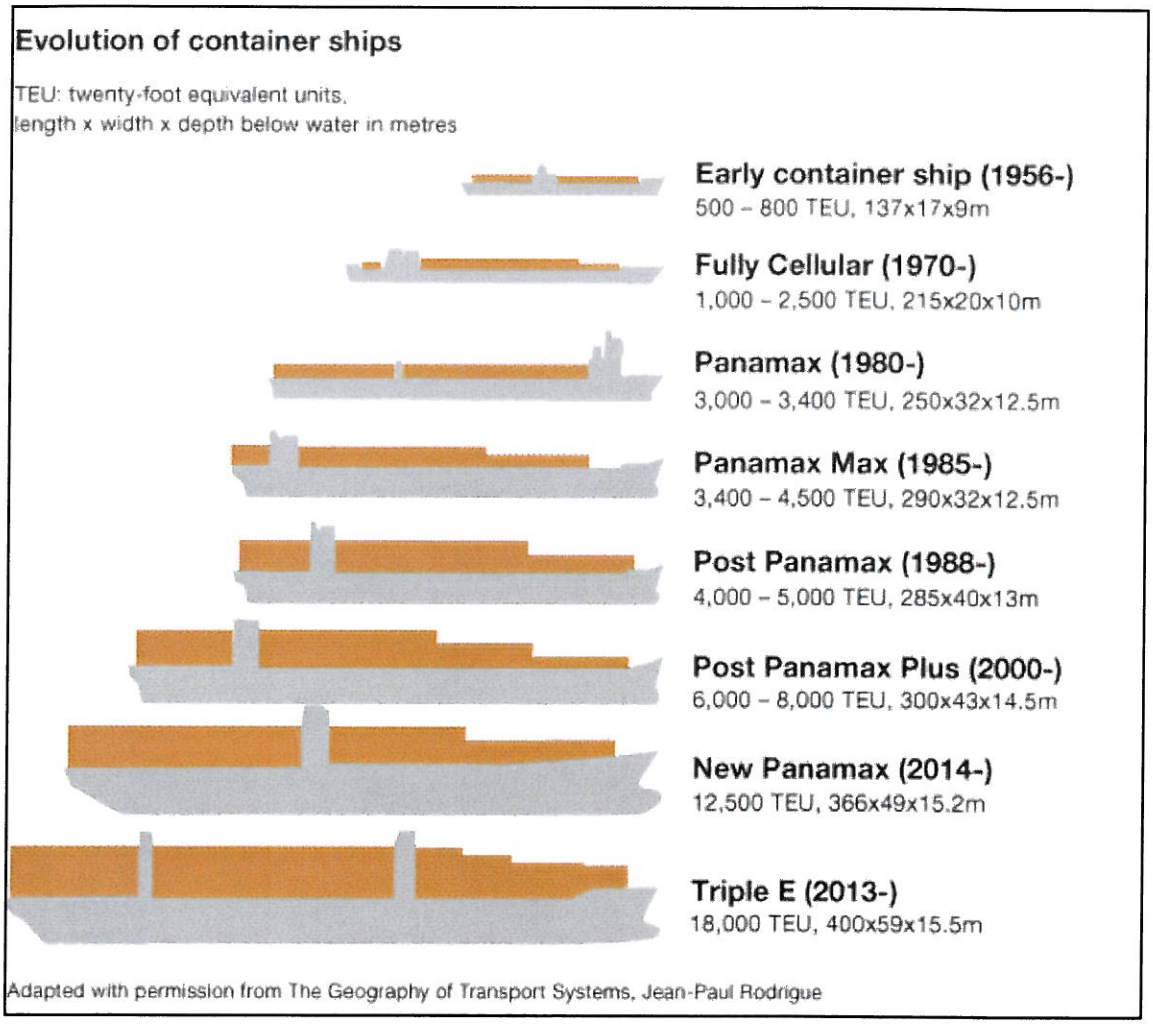

Figure 2.1: The evaluation/ the history of improvement

The advancement of technology has contributed to the improvement of the effective of the quantity of one shipment and shipping line also time consuming. Many studies of shipping line focused on applying model and statistical technology. This enabled managers in the shipment industries to achieve their business targets such as satisfying customers' demands and obtaining high profit by reducing idle time.

2.2.2 Design of Shipping Line

Initially, the design of shipping line started as only a line with the destination was a quite simple. It consisted of a few stages and each stage consisted of several step/procedure. The shipping line was developed according to the element of shipping

that relate with the line of shipment. The shipping line should have a high scheduling to run the operations among the stages. For the reasons, researchers proposed certain design of shipping line to achieve the highest reducing idle time that related to the element of shipment. Figure 2.2 shows one stages of the shipping line that is the container arriving the Brunei Port.

Figure 2.2: Example of shipment part

In 2012, Almieda proposed how to design more efficient ships which was recently that evaluated a number of new technologies and design concepts aimed at cutting operating costs, while at the same time reducing ship emissions (Almieda, 2012). Figure 2.3 present the technologies are grouped under four main headings.

Figure 2.3: The main part of operation

Mcgraw-hill (2005) proposed a ship design these other skills include marine engineering, structural design, and production engineering. The ship design process is iterative, and is subdivided into several phases during which the design is developed in increasing degrees of detail. Typically, the owner's requirements specify the mission that the new ship must perform and define such parameters as required speed, fuel endurance, and cargo weight and capacity. The addition to unique mission requirements and constraints, every ship must satisfy certain physical principles. The fundamental principles are that (1) the ship hull and superstructure must have adequate storage space, and (2) the ship must float at an acceptable waterline (draft neither too great nor too small) when it is fully loaded. Another principle is that the ship must be statically stable; that is, when it is displaced from its equilibrium condition, it must tend to return to that condition. Figure 2.4 shows the typical hub and stoke liner shipping network (network design).

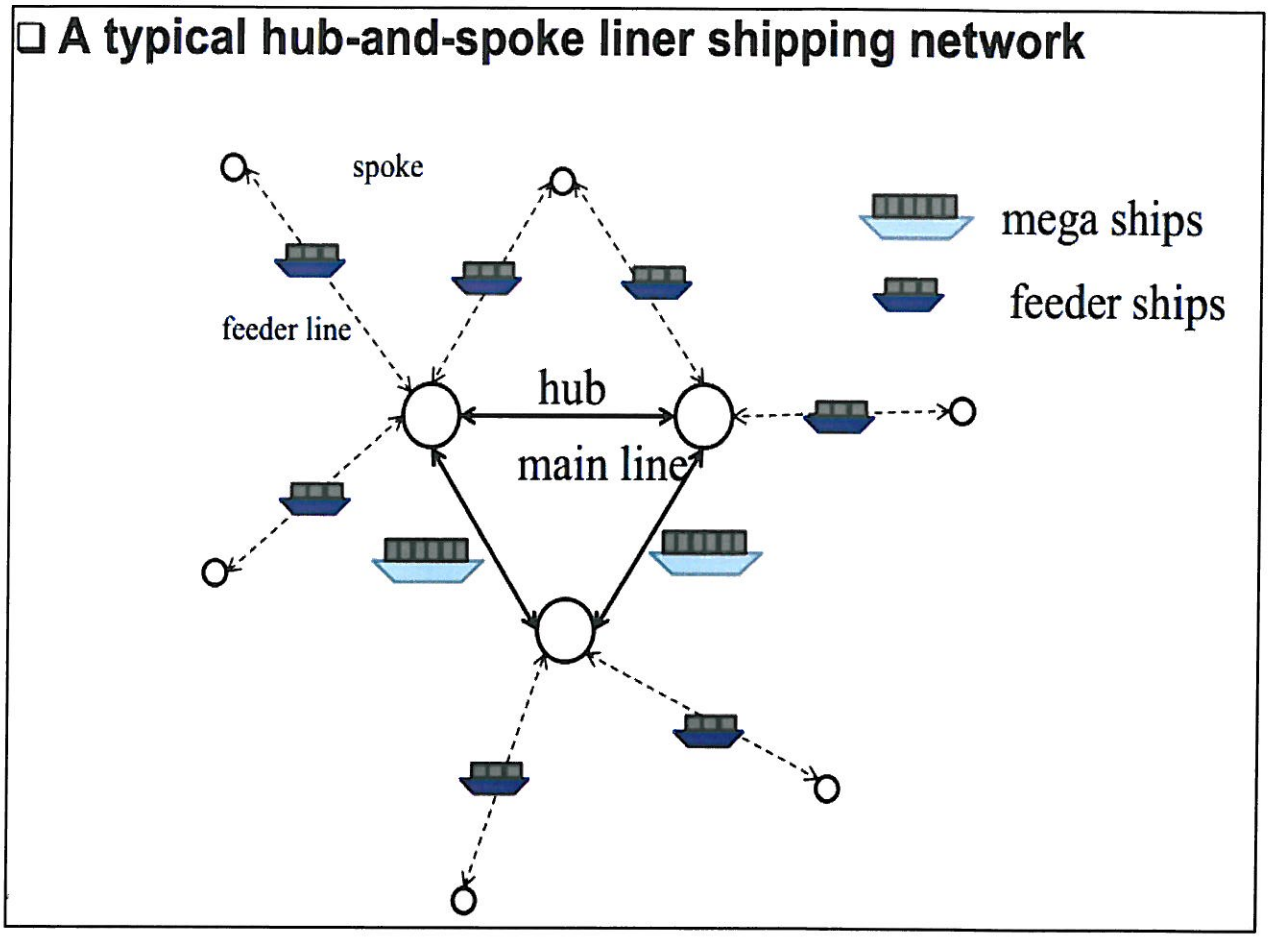

Figure 2.4: Example of shipping destination

2.2.3 Operation Research Models for the Shipping Line

Maritime transport is an important mode of transport in international trade. It is important for liner shipping companies to maintain cost efficient and robust liner shipping networks. The use of operations research models and techniques in both the construction of liner shipping route networks and the disruption management process is still limited, but it is expected that significant improvements can be made by using such models (Judith Mudler, 2011)

i. Idle time (IT): The amount of ineffective time whereby the available resources are not used e.g. a container in a yard.

ii. In Transit: The status of goods or persons between the outwards customs clearance and inwards customs clearance.

iii. Intermodal Transport: The movement of goods (containers) in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes.

iv. Schedule: A timetable including arrival/departure times of ocean- and feeder vessels and also inland transportation. It refers to named ports in a specific voyage (journey) within a certain trade indicating the voyage number. In general: The plan of times for starting and/or finishing activities.

v. Simulation: The imitation of the reality for studying the effect of changing parameters in a model as a means of preparing a decision.

vi. Supply chain: A sequence of events in a goods flow which adds to the value of a specific good. These events may include: conversion, assembling and/or disassembling movements and placements.

vii. Queue: A stored arrangement of computer data, programs or messages, waiting to be processed in the order in which they were submitted.

viii. Quality: The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.

2.3 STRUCTURE OF MODEL SHIPPING TRANSPORTATION SYSTEM

The model of shipping transportation system is a flow-line production system which has great performance in the industrial shipping transportation. More recently, it even gained importance in low idle time shipping line in system. The model of shipping line has been active field of research over more than half century. This led to massive body of literature covering a plenty of key pieces of information of shipping model line.

The transportation model uses the principle of 'transplanting' something, like taking a hole from one place and inserting it in another without change. First it assumes that to disturb or change the idea being transported in any way will damage and reduce it somehow. It also assumes that it is possible to take an idea from one person's mind into another person's so that the two people will then understand in exactly the same way. The transportation model is a valuable tool in analyzing and modifying existing transportation systems or the implementation of new ones. In addition, the model is effective in determining resource allocation in existing business structures like in figure 2.5 (Mgorly, 2009).

You cannot carry out transportation planning or creation of shipment after the goods issue has been executed. Once goods issue is done it means that the material has left your premises so there is no need for a transportation planning after it.

In case you need carry out the shipment documents at the end of the day you could just create the delivery documents during the day and at end of the day create the shipment documents and the goods issue (Jyoti Prakash, 2011)

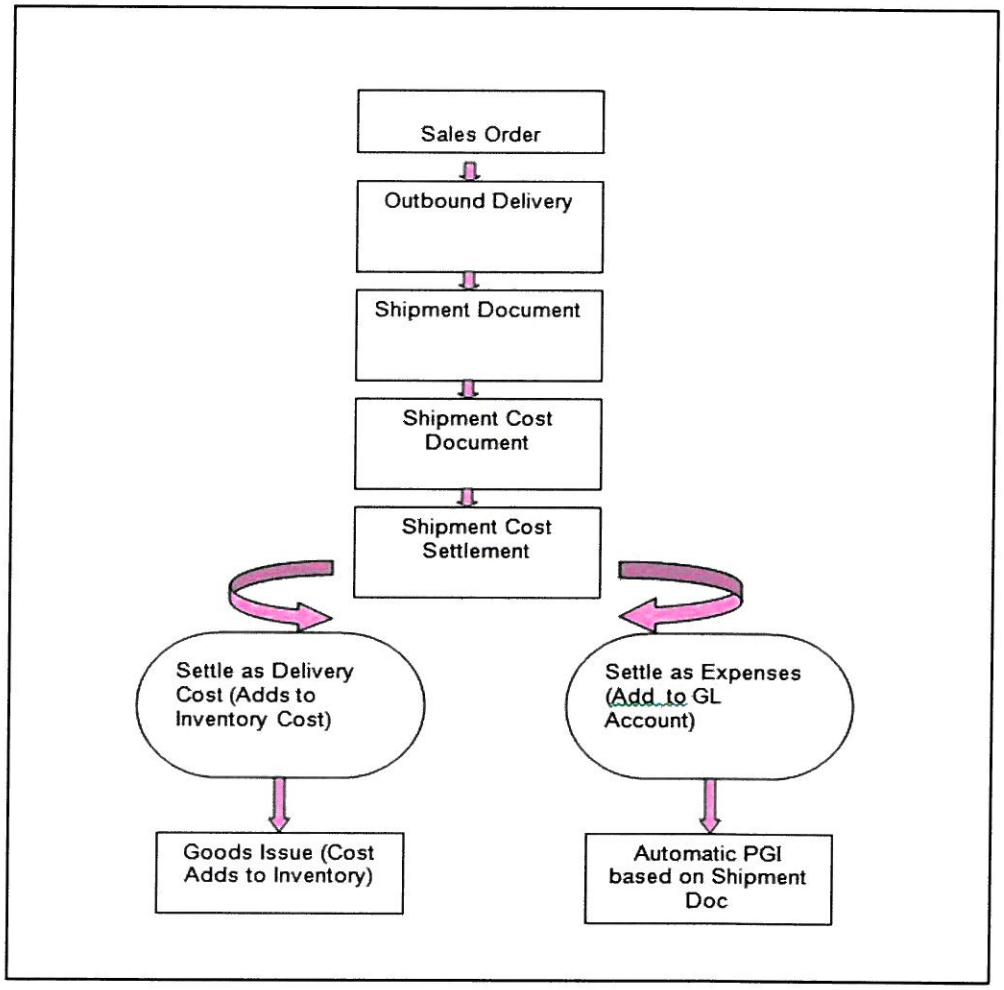

Figure 2.5: Shipment Document

The transportation modeling finds the least-cost means of shipping supplies from several origins to several destinations. Origin points can be factories, warehouses, or anything from which goods are shipped. Destinations are any points that receive goods. To use the transportation model, we need to know the following step; first is

origin points and the capacity, second is the destination points and the demand period and last is the cost of shipping one unit like figure 2.6 (Drezner.Z, 1995).

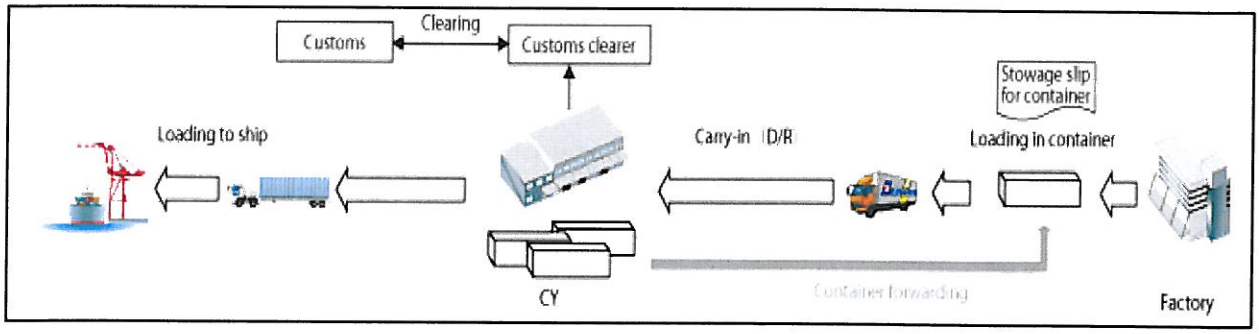

Figure 2.6: Shipping line

2.4 BACKGROUND OF MODEL LINE SHIPPING SYSTEM PROBLEMS

The shipping systems line model of the logistics industries has two main problems. The first problem is the dual transportation problem of the shipping model line system. Second is unbalanced shipping model line problem that with the amount and location of available supplies and the quantities demanded have problem. The next section will discuss this problem in details.

2.4.1 The Dual Transportation Problem

The first problem of the shipping line model is regarding of shipping dual line were the clash of scheduling does not be able to send the product in one way. For the plant under study, usually the shipment will increase the cost or will increase the idle time of shipment. These problems cause the reducing profit of the company and will increase the number of worker and line of shipment. However, to solve this issue, many researchers presented different model and solution to obtain the best solution or the optimum plan of shipping model line.

Every Linear Programming (LP) has dual. The clever method is to notice the transportation problem was written as a minimization (so that the dual will be maximization); it had equality constrained (dual constraint). Here is a way think of the